

What is claimed is:

1. A membrane bioreactor process comprising:
performing a biological reaction within a bioreactor feed tank containing a liquid biomass feedstock;

providing at least one airlift membrane device separating the feedstock into a retentate and a substantially biomass-free filtrate;

the device having a bottom end face and a top end face and comprising a structure of at least one monolith of porous material, the monolith having a plurality of passageways extending longitudinally from the bottom end face to the top end face, the surface area of the passageway wall surfaces being at least 150 square meters per cubic meter of monolith volume, and the membrane device further containing at least one filtrate conduit for carrying filtrate from within the device toward a filtrate collection zone;

the porous material having a porosity of at least 30% and a mean pore size of at least 3 microns, and a porous membrane having a mean pore size below about 1 micron applied to the passageway wall surfaces to provide a biomass separating membrane barrier;

introducing the liquid feedstock into said airlift membrane device at the bottom end face and sparging gas below the bottom end face to provide airlift circulation of the feedstock through the membrane device; and

separating the feedstock under an applied transmembrane pressure into filtrate removed to the filtrate collection zone and gas-containing retentate that passes through the top end face of the membrane device.

2. The process of claim 1 in which the membrane device is submerged in the bioreactor feed tank.

3. The process of claim 1 in which the membrane device is installed external to the feed tank.

4. The process of claim 1 in which at least a portion of the transmembrane pressure is created with a filtrate pump.

5. The process of claim 3 in which at least a portion of the transmembrane pressure is created by pressurizing the feedstock above the pressure in the bioreactor feed tank.

6. The process of claim 5 in which the feedstock is pressurized with a pump.

7. The process of claim 1 in which the membrane device is mounted in a vertical orientation.

8. The process of claim 1 performed under aerobic conditions.

9. The process of claim 1 performed under anaerobic conditions.